

Study Guide

Permutations

An arrangement or listing in which order is important is called a permutation.

Example 1 There are 6 sailboats in a race. How many arrangements of first, second, and third place are possible?

There are 6 choices for first place, then 5 choices for second place, then 4 choices for third place.

$$6 \times 5 \times 4 = 120$$

The number of permutations is 120.

Some arrangements involve all of the members of a group.

Example 2 There are 6 sailboats in a race. In how many ways can they finish the race?

There are 6 choices for first, 5 choices for second, and so on.

$$6 \times 5 \times 4 \times 3 \times 2 \times 1 = 720$$

There are 720 ways in which the sailboats can finish the race.

The expression $6 \times 5 \times 4 \times 3 \times 2 \times 1$ can be written $6!$. It is read "six factorial." In general, $n!$ is the product of the counting numbers starting at n and counting backward to 1.

Find the value of each expression.

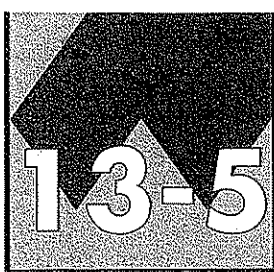
1. $1!$

2. $4!$

3. $P(5, 2)$

4. $P(7, 3)$

5. In how many ways can winner, first runner-up and second runner-up be chosen from 8 riders in a horse show?
6. In how many ways can 5 horses in a race cross the finish line?
7. In how many different ways can 4 people stand in line for a movie?
8. In how many ways can the gold, silver, and bronze metals be awarded to 10 swimmers?



Name _____ Date _____

Practice

Permutations

Find the value of each expression.

1. $6!$
2. $9!$
3. $P(6, 3)$
4. $P(9, 8)$
5. $P(10, 1)$
6. $P(8, 8)$

Solve.

7. How many different ways can seven people be seated in one row of seven people?
8. Suppose that eight students out of ten qualify for the cheerleading squad. In how many ways can you choose the squad?
9. In how many ways can a president, vice-president, secretary, and treasurer be chosen from a club with 12 members?
10. In how many ways can five books be arranged on a shelf?
11. In how many ways can a phone number be created if there are ten ways that the first three digits can be arranged and then each of the remaining four digits can be any digit from 0-9 as long as no digit is repeated in the group of four?
12. How many different four-letter words can be made from the alphabet if the first two letters come from the first half of the alphabet and the second two letters come from the second half of the alphabet?